PNE-431

PROJECT CHARIOT -- FINAL REPORT

INVESTIGATION OF SEA-CLIFF BIRDS, CAPE THOMPSON, ALASKA

AEC CONTRACT NO. AT (04-3) - 310

L. Gerard Swartz

Department of Biological Sciences

University of Alaska

May 1964

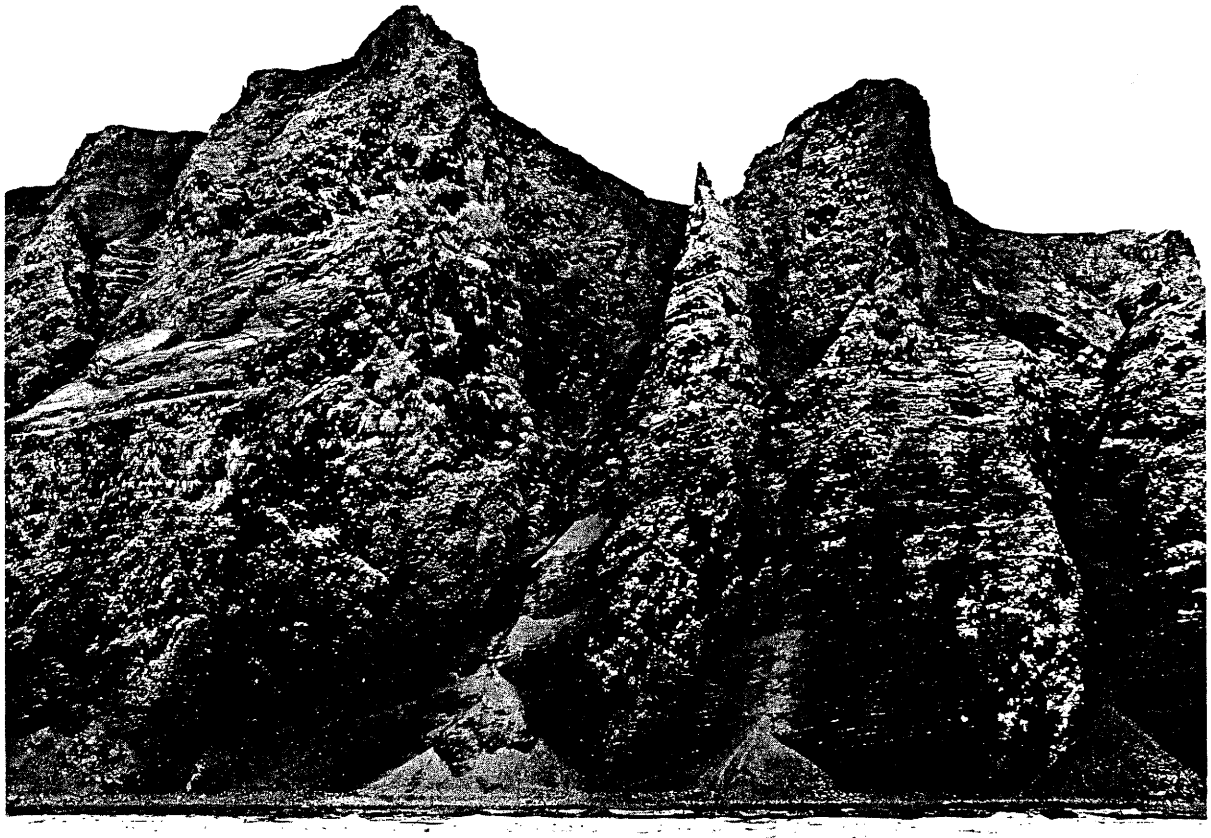
L E G A L N O T I C E

In citing this manuscript in a bibliography the reference should be followed by the phrase: UNPUBLISHED MANUSCRIPT.

ERRATA

page	line	
3	4	"1959" should read "1960"
58	3	". . . page 12 . . ." should read ". . . page 53. . ."
60	11	"Uspenski, 1958" should read "Uspenski, 1956"
66	6	"1.876" should read "1.88"
68	19	"Ridgeway" should read "Ridgway"
119	1	"Biomass and food consumption at . . ." should read "Biomass and food consumption of adults at . . ."
121	11	"Table 27," should read "Table 29,"
123	14	"10" should read "16"
	15	"2" should read "4"
127		After line 27, add: "Peterson, R. T. 1961. A field guide to western birds. Houghton Miflin Co., Boston. 366 p."
	28	"Ridgeway" should read "Ridgway"
128	5	"Uspenski, S. M." should read "Uspenski, S. M. 1956."

Typical cliff top and glaucous gull nest site. Colony 3, 9 July 1960.



Colony 5 viewed from the ice, 14 June 1960.

PROJECT CHARIOT -- FINAL REPORT

INVESTIGATIONS OF SEA-CLIFF BIRDS, CAPE THOMPSON, ALASKA

by

L. Gerard Swartz

May 1964

TABLE OF CONTENTS

INTRODUCTION

Approximately seven miles of precipitous coastline between Ogotoruk Creek and Point Hope, Alaska, support colonial sea birds in numbers exceeding 400,000. These sea-bird colonies are perhaps the most immediately dramatic biotic feature of the Cape Thompson area and take part in an ecosystem of major importance. The primary objectives of this paper are to present data on ecology and breeding biology of the sea birds, on the species composition and abundance of the sea-bird fauna, and on the components and dynamics of the sea-bird ecosystem at Cape Thompson.

In contrast to the sea-bird colonies in the North Atlantic and western Soviet Arctic, those in the North Pacific Ocean and the Chukchi Sea remain poorly known, particularly those in the Chukchi Sea. Gabrielson and Lincoln (1959) have collated scattered information from the early days of Alaskan ornithology. Data gathered during the Russian period largely concern the area south of Bering Strait and, in common with that deriving from the early American expeditions, suffers from the short period of study and the incidental nature of ornithological studies. Knowledge of the colonies in the islands of the northern Bering Sea has been bolstered by three recent papers: Cade (1952) lists species observed on Sledge Island with notes on ecology and breeding biology; Fay and Cade (1959) list breeding birds on St. Lawrence Island and include ecological analyses; Kenyon and Brooks (1960) list, with annotations, species observed on Little Diomede. Few papers, however, consider colonies north of Bering Strait. Grinnell (1900) includes data on Puffin and Chamisso Islands in Kotzebue Sound. Bailey (1925, 1948) cites his own observations north of the Strait and collates the observations of others on a number of colonial species.

Curiously, until the first published report (Wolfe, 1960) on the present studies, the large Cape Thompson colonies have remained essentially unknown to the scientific community, though a few brief references to these colonies exist prior to Wolfe (op. cit.). Four of these references result from the cruises of the U. S. Revenue

Steamer THOMAS CORWIN in 1880 and 1881. Hooper (1881:48), speaking of the 1880 voyage, mentions ". . . a small party of natives encamped here, engaged in catching birds with nets." That these were breeding sea birds is clarified by his comments from the 1881 voyage (Hooper, 1884) to the effect that Cape Thompson is a favorite camping spot, partly because of the abundance of birds and eggs on the cliffs. Hooper (1884), Nelson (1883), and Muir (1917) comment briefly that sea birds were seen here in 1881. The only other record I have found was published by Hudson (1957:28) and contains a sight record from an airplane of murres ". . . swarming about sea cliffs . . . a few miles south of Point Hope." R. A. Gilmore landed for two hours at Cape Thompson on 25 August 1931, but did not publish his observations, though Bailey (1948) reports having examined two specimens of Uria lomvia taken by Gilmore at Point Hope. Gilmore's field notes (kept at the Museum of Vertebrate Zoology, University of California, Berkeley) contain several pages of observations of the colonies and notes on several of the species found breeding.

With the exception of colonies at Cape Lisburne, about 40 miles north, the Cape Thompson colonies are the northernmost on the western coast of North America. As such they possess considerable interest beyond their mere existance as a large and hitherto virtually unknown aggregation of breeding sea birds. Not only is the location potentially advantageous in investigating biological phenomena at a latitudinal extreme, but the body of basic data now available on almost the whole biota and physical environment presents a nearly unique opportunity for ecological studies in an arctic region. I hope that this paper will lay a foundation for further studies of sea birds by others.

SCHEDULE OF FIELD RESEARCH

Field work on the current studies began in 1959 and extended from 15 June to 9 September, 1959; from 2 April to 21 October, 1960; and from 27 April to 3 October, 1961. One winter visit was made from 27 February to 1 March, 1959. The size of the field party varied from year to year with a maximum of three in 1959 (from 1 July to 12 August, only one), a maximum of seven during a short period of intense census effort in 1960, and a maximum of three in 1961. Early and late season observations on the establishment and breakup of the colonies were made by a single man. No early season observations were possible in 1959.

ACKNOWLEDGEMENTS

I am deeply indebted to the following persons who, along with myself, conducted the field work during parts of the investigations: Dr. B. Kessel, Dr. G. W. Cox, Dr. J. F. Opsahl, Dr. G. C. West, D. O. Hill, L. M. Belson, E. L. Schene, E. J. Willoughby, K. M. Jones, W. T. VanVelzen, and my wife, M. M. Swartz. I owe a particular debt of gratitude to Dr. Cox who directed the field party during much of the 1960 field season and who contributed greatly to analysis and preparation of data during the winter of 1960-1961. I wish also to acknowledge the cooperation of Mr. Francis S. L. Williamson who has been most generous in sharing data on sea birds obtained by his research group. Many other investigators contributed in significant measure, large and small, by an enthusiastic, cooperative interest in these studies, resulting in many useful field observations which would not otherwise have been possible to gather.

Vertebrate and invertebrate food samples taken in 1959 were identified by Dr. N. J. Wilimovsky. Dr. James E. Morrow identified fishes from subsequent years. Invertebrates after 1959 were identified by Ian Ellis and W. T. Pereyra of the University of Washington.

I am also indebted to Dr. W. Z. Lidiker, Dr. A. H. Miller, and the staff of the Museum of Vertebrate Zoology, University of California, Berkeley, for the use of their facilities during two visits.

I also owe thanks to Dr. Brina Kessel for critical review of the manuscript.

These studies were supported by contract No. AT(04-3)-310 between the University of Alaska and the U. S. Atomic Energy Commission.

THE PHYSICAL ENVIRONMENT

Geological and climatological features of the sea cliff area are presented in detail in reports of other Project Chariot investigations. Discussion below will concern only those factors which directly impinge on the biology of the colonial sea birds, the functioning of the ecosystem, or on the conduct of the investigation. Data cited below are summarized largely from Wolfe (1960), who reports on data gathered by the United States Weather Bureau beginning on 1 September 1959.

The climate is severe. High winds are prevalent in the Cape Thompson-Ogotoruk Creek region. From October 1959 to September 1960, average winds over 30 knots occurred on 47 days, 21-30 knots on 78 days, 11-20 knots on 163 days, and 10 knots or less on only 88 days. Only four of 1,096 observations in 1959 reported calm. Winds may present serious problems to the birds and to the investigators, especially when blowing onshore. Sea storms are common in the summer months, particularly in late summer, according to our own experience and the testimony of Eskimo inhabitants of the region.

Cloudy days are the rule during the breeding season. In 1960 there were a total of only 19 clear days during June through September. Annual precipitation probably averages about 8 inches, a large proportion of this falling during the summer. In 1960, 6.34 inches fell in the months June through September. Total precipitation October 1959 through September 1960 was 8.63 inches.

Formation, dissolution, and dissipation of sea ice depends on a complex of factors, including wind, water currents, and temperature. As a result, ice conditions may vary greatly from day to day. Delimiting the average date of "final freezup" is not possible, although open water available to sea birds near the cliffs is ordinarily greatly restricted beginning in February when a large body of stable ice becomes established in the embayment south of Point Hope and extends south of the cliffs. A zone of grounded ice here may extend two or more miles offshore. This zone is the last to disappear in the summer and during 1959, 1960 and 1961 broke up by the end of the first week in July.

Breeding sea birds occur in five concentrated groups on the higher, more stable, cliffs. The colonies are scattered from Point Crowbill, just northwest of the mouth of Ogotoruk Creek, to the end of the cliffs about 1.5 miles west-northwest of Cape Thompson. The groups of breeding birds are here referred to as "colonies," each colony separated from the next by topographic discontinuities of low relief and softer rock which vary from a few hundred yards up to 1.5 miles in length. Each colony has been designated by a number beginning with Colony 1 at Point Crowbill and extending to Colony 5 west-northwest of Cape Thompson (see Fig. 1). Cliffs supporting bird colonies range from 30 feet to more than 600 feet in height. Most of the rock is soft and extensively fractured, and, except for a few places, nesting ledges are not safely accessible by man. Small or large rock falls are common, and a more or less continuous shower of stones falls from many of the cliff faces. A narrow gravel beach separates most of the cliffs from the ocean, but in only one colony (Colony 5) is it continuous. In Colonies 1 through 4, one to several headlands project into the ocean, rendering much of the study area inaccessible except by boat. Storms and movement of the sea ice often work considerable change in shoreline topography from year to year.

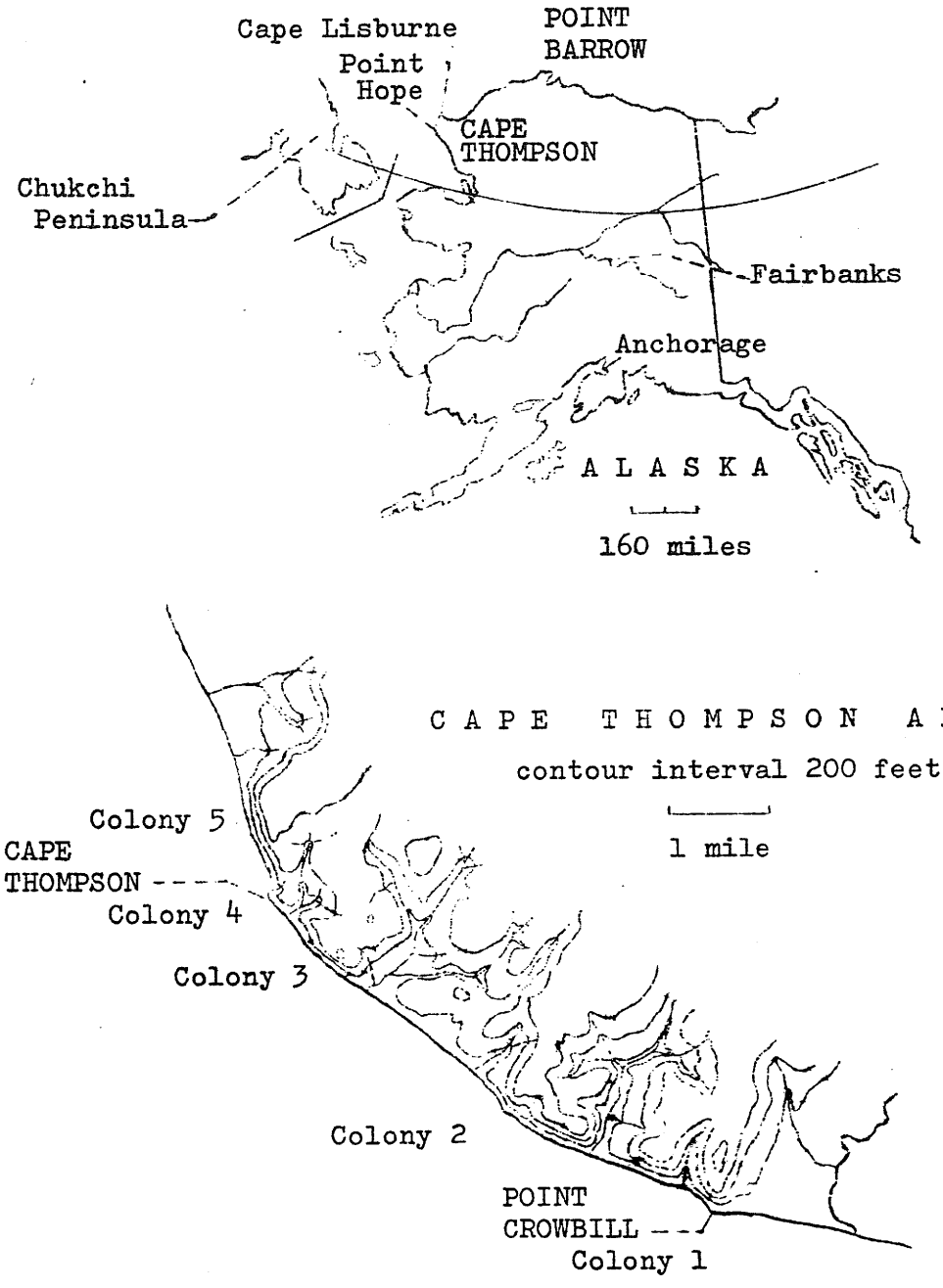


Figure 1. Location of sea bird colonies

SUMMARY

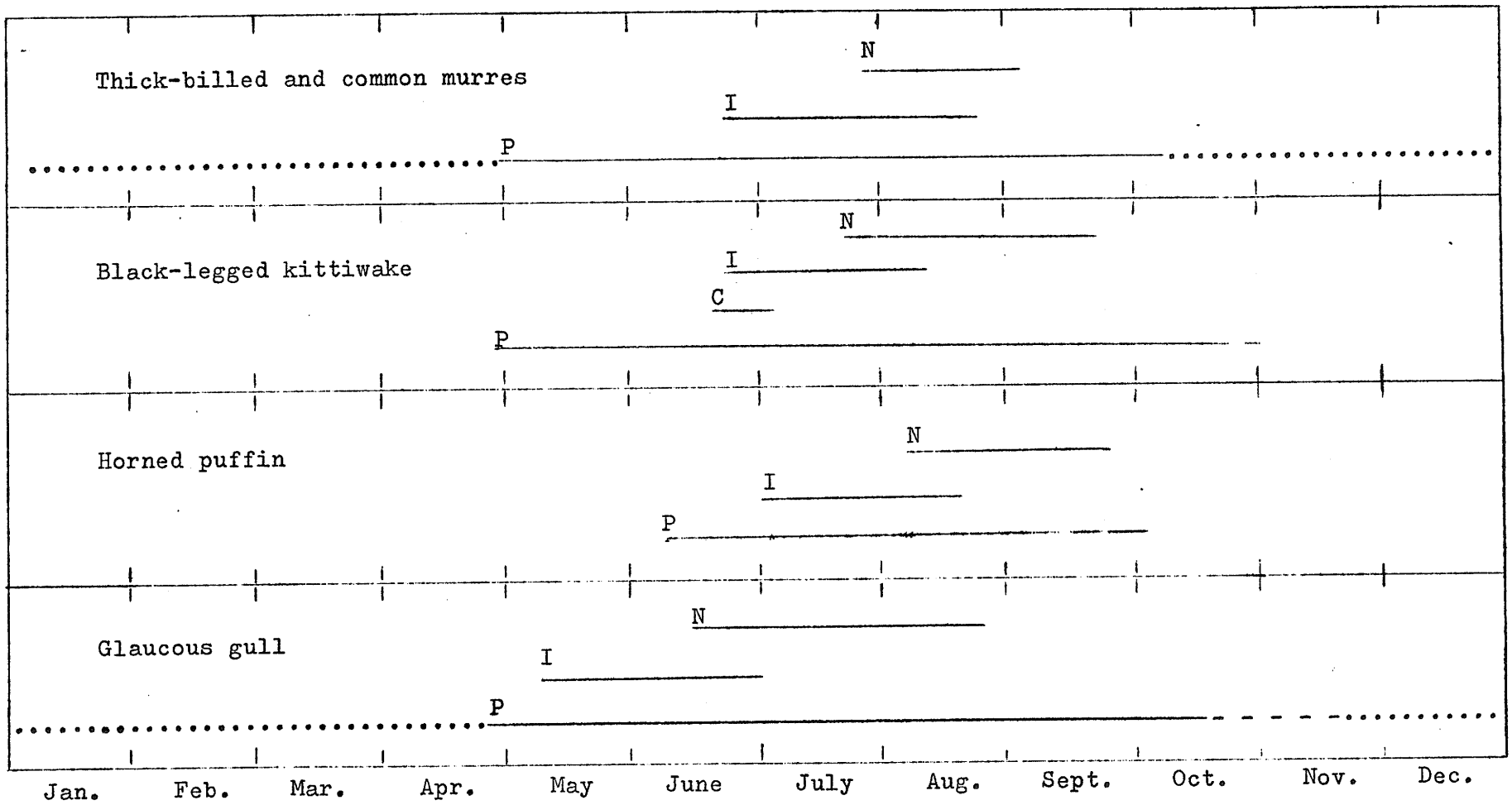
The sea cliffs in the vicinity of Cape Thompson support over 400,000 sea birds which maintained essentially stable populations during the three years of study. Nine species are regularly represented as breeders and are listed below in order of decreasing abundance. Numbers given are abundances as determined in 1960.

Thick-billed murre	236,000
Common murre	157,000
Black-legged kittiwake	26,000
Horned puffin	1,900
Glaucous gull	304
Pelagic cormorant	46
Tufted puffin	36
Black guillemot	10
Pigeon guillemot	2

Dates of periodic phenomena were determined for most species during all years. The phenologies of the most important species are summarized in Fig. 16. In general, the colonies are active from about 1 May through September though weather and ice conditions may modify this pattern.

The breeding biology of all of the sea bird species has been investigated to degrees varying with the importance of the species in the ecosystem. Comparisons have been made with the results of other workers in other parts of the world when meaningful in the light of differing environmental factors.

The broad outlines of the trophic structure of the ecosystem in which the sea birds take part have been worked out. A simplified diagram is presented in Fig. 17. Almost all of the nutrition for the sea cliff colonies is drawn from the sea and is calculated to be about 13,000 metric tons wet biomass per breeding season. Many of the details of the food habits of sea bird species have been determined.



The ends of the lines represent the extremes observed during the three years of study (see text for variability).

P	Presence in area	...	Presence in nearby areas in small numbers
——	Presence at cliffs	C	Period of nest construction
- -	Probable presence at cliffs	I	Period of egg-laying and incubation
		N	Period of hatching and nestling life

Figure 16. Diagram of the phenology of the principal species at Cape Thompson.

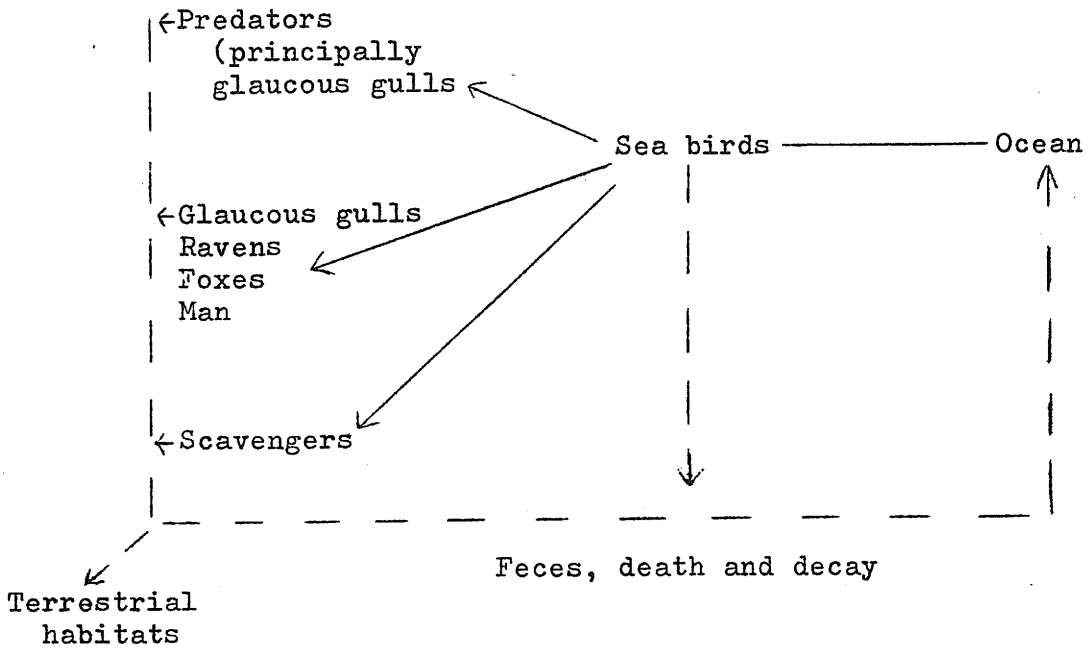


Figure 17. Simplified diagram of the food web at the Cape Thompson colonies.